US-PAT-NO: 5840631

DOCUMENT-IDENTIFIER: US 5840631 A

TITLE: Method of manufacturing semiconductor device

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Detailed Description Text - DETX (13):
As shown in FIG. 1F, a 0.01-.mu.m thick titanium film 111 and a 0.05-.mu.m thick titanium nitride film 112 are sequentially formed on the entire surface of the silicon oxide film 108 including the through hole 110 by sputtering and reactive sputtering. A 0.2-.mu.m thick tungsten film 113 is formed on the titanium nitride film 112 by a blanket CVD method at a substrate temperature of 400.degree. C. and a pressure of 5,000 Pa using tungsten(VI) **fluoride** (WF.sub.6) gas and hydrogen gas.

Detailed Description Text - DETX (33):
Hydrogen **fluoride** (HF) gas as a compound having a catalysis is fed near the wafer 303 at a flow rate of 5 sccm to promote dehydration and condensation reaction of a reaction intermediate of TEOS, water, and ozone. At this time, the bubbling temperature of the TEOS solution 309 is 65.degree. C., and that of the water 311 is 30.degree. C. Reference numeral 301 denotes a heater; 302, a susceptor; 304, a dispersion head; 305, a reaction chamber; 306, an ozonizer for generating ozone from oxygen; 307, a flow controller; and 308, a constant-temperature bath.

Detailed Description Text - DETX (34):
According to the above method, the silicon oxide film 108 is formed on the surface of a silicon substrate 1 which includes the multilayered interconnection 107 formed selectively, like the structure shown in FIG. 1D. Subsequent steps of completing the manufacture of a semiconductor device are the same as in FIGS. 1C to 1F, and a description thereof will be omitted. Note that the **fluorine** (F) concentration in the silicon oxide film 108 formed in the third embodiment was as very low as 1.2 atomic %.

Detailed Description Text - DETX (35):
As described above, if **fluorine** is used as a compound having a catalysis in the third embodiment, the same effects can be obtained as in the first embodiment using phosphoric acid in terms of a decrease in OH radicals in the silicon oxide film 108 and suppression of surface roughness. Further, electrical characteristics such as a connection resistance and threshold voltage variations were measured in a two-level interconnection structure identical to that in FIG. 1F to obtain the same results as in the first embodiment.

Claims Text - CLTX (5):
2. A method according to claim 1, wherein the added compound gas consists of one acid gas comprising one of phosphorus, boron, and **fluorine**.

Claims Text - CLTX (20):
forming an upper wiring layer on said silicon oxide insulating film, wherein the added compound gas consists of one acid gas comprising one of phosphorus, boron, and **fluorine**.

Claims Text - CLTX (25):
adding a small quantity of acid gas having a catalytic effect, said acid gas comprising one of: phosphorous, boron, and **fluorine,** for promoting formation of silicon oxide using a main component gas comprising ozone, water vapor, and one of alkoxysilane and organosiloxane as a source gas to form a silicon oxide insulating film by a chemical vapor deposition (CVD) method on a surface of said semiconductor substrate on which said lower wiring layer is formed, said small quantity of the acid gas being small relative to the quantity of said main component gas; and

US Reference Patent Number - URPN (1):
4360393

US Reference Group - URGP (1):
4360393 19821100 Koval 148/171

US-PAT-NO: 5324686

DOCUMENT-IDENTIFIER: US 5324686 A

TITLE: Method of manufacturing semiconductor device using hydrogen as a diffusion controlling substance

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Detailed Description Text - DETX (4):
The present inventors have a patent covering the technical idea noted above, i.e., U.S. Pat. No. **5,173,440**. The technical idea relating to the chemical state and the diffusion behavior of the impurity, which is disclosed in the previous application, is incorporated in the present specification as a reference.

Detailed Description Text - DETX (6):
In the present invention, hydrogen constitutes a typical example of a diffusion control substance serving to reduce the impurity contained in the doped glass. Hydrogen may be supplied in the form of a hydrogen molecule, H.sup.+ ion or hydrogenated ion such as SiH3.sup.+. The ionized hydrogen is bonded to an oxygen atom in the SiO.sub.2 network in place of an impurity atom such as an arsenic atom. As a result, the impurity such as arsenic is released from the SiO.sub.2 network so as to be put in a reduced state. Naturally, substances other than hydrogen may be used in the present invention as a diffusion control substance serving to reduce the impurity, as far as the substance can be bonded to the oxygen atom within the

SiO.sub.2 network in
place of the impurity atom such as an arsenic atom. To be more specific, a
halogen element such as **fluorine** and chlorine may also be used in the present
invention as the diffusion control substance.

US Reference Patent Number - URPN (4):
5173440

US Reference Group - URGP (4):
5173440 19921000 Tsunashima et al. 437/164

US-PAT-NO: 6380040

DOCUMENT-IDENTIFIER: US 6380040 B1

TITLE: Prevention of dopant out-diffusion during silicidation and junction formation

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Detailed Description Text - DETX (11):
Thereafter, as depicted in FIG. 3H, a heating step is carried out in an environment saturated with a species S of the second conductivity type of impurities of doped film 371. For example, if the second conductivity type of impurities is phosphorus, species S is phosphene; if the second conductivity type of impurities is arsenic, species S is arsene. Likewise, species S may also be boron **fluoride,** antimony or indium depending on the second conductivity type of impurities.

Claims Text - CLTX (7):
3. The method according to claim 2, wherein the species comprises phosphene, boron **fluoride,** indium, antimony or arsene.

US Reference Patent Number - URPN (6):
5478776

US Reference Patent Number - URPN (11):
5770490

US Reference Group - URGP (6):
5478776 19951200 Luftman et al.

US Reference Group - URGP (11):
5770490 19980600 Frenette et al.

US-PAT-NO: 6064096

DOCUMENT-IDENTIFIER: US 6064096 A

TITLE: Semiconductor LDD device having halo impurity regions

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Detailed Description Text - DETX (6):
As shown in FIG. 2C, the first photoresist film 26 is removed, and a second photoresist film 28 is formed over the NMOS region of the semiconductor substrate 21. As a result, the PMOS gate structure 24b and the upper surface of the PMOS region on each side of the PMOS gate structure 24b are exposed. Preferably, ionized boron B (10-20 keV, 1E13-5E14 cm.sup.-2) or ionized boron **fluoride** BF.sub.2 (20-40 keV, 1E13-5E14 cm.sup.-2) is then implanted into the exposed PMOS region. The implanted B or BF.sub.2 forms p.sup.- low density (LD) regions 29 (low density P-type impurity regions) on each side of the PMOS gate structure 24b and with a portion thereof formed under the first sidewalls 25 of the PMOS gate structure 24b.

Detailed Description Text - DETX (19):
As shown in FIG. 3E, a third photoresist film 51 is formed over the NMOS region. As a result, the PMOS gate structure 44b with the first and second sidewalls 47 and 50, respectively, and the upper surface of the PMOS region on each side of the second sidewalls 50 are exposed. Preferably, ionized boron B (10-20 keV, 1E15-3E15 cm.sup.-2) or boron **fluoride** BF.sub.2 (20-40 keV, 1E15-5E15 cm.sup.-2) is implanted into the exposed PMOS

region. The implanted
ionized B or BF.sub.2 forms p.sup.- source and drain (S/D) regions 52 (high
density P-type source and drain impurity regions) on each side of the PMOS gate
structure 44b and with a portion thereof formed under the second sidewalls 50
of the PMOS gate structure 44b.

US Reference Patent Number - URPN (10):
5770490

US Reference Group - URGP (10):
5770490 19980600 Frenette et al.

	Type	L #	Hits	Search Text	DBs	Time Stamp	Comments	Error Definition	Erro
1	BRS	L1	5	"6057216"	USPAT; US-PGPUB; EPO; JPO; DERWENT;	2003/07/04 12:36			0
2	BRS	L8	1	1 and (fluorine or fluoride)	USPAT; US-PGPUB; EPO; JPO; DERWENT;	2003/07/04 12:42			0
3	BRS	L15	2	"20010021575"	USPAT; US-PGPUB; EPO; JPO; DERWENT;	2003/07/04 12:39			0
4	BRS	L22	0	15 and (fluorine or fluoride)	USPAT; US-PGPUB; EPO; JPO; DERWENT;	2003/07/04 12:39			0
5	BRS	L29	4	"5946580"	USPAT; US-PGPUB; EPO; JPO; DERWENT;	2003/07/04 12:40			0
6	BRS	L36	32	"5902125"	USPAT; US-PGPUB; EPO; JPO; DERWENT;	2003/07/04 12:40			0
7	BRS	L43	26	"5770490"	USPAT; US-PGPUB; EPO; JPO; DERWENT;	2003/07/04 12:40			0
8	BRS	L50	22	"5478776"	USPAT; US-PGPUB; EPO; JPO; DERWENT;	2003/07/04 12:40			0
9	BRS	L57	5	"5322805"	USPAT; US-PGPUB; EPO; JPO; DERWENT;	2003/07/04 12:40			0
10	BRS	L64	14	"5173440"	USPAT; US-PGPUB; EPO; JPO; DERWENT;	2003/07/04 12:40			0

	Type	L #	Hits	Search Text	DBs	Time Stamp	Comments	Error Definition	Erro
11	BRS	L71	12	"4619719"	USPAT; US-PGPUB; EPO; JPO; DERWENT;	2003/07/04 12:40			0
12	BRS	L78	8	"4605450"	USPAT; US-PGPUB; EPO; JPO; DERWENT;	2003/07/04 12:40			0
13	BRS	L85	8	"4360393"	USPAT; US-PGPUB; EPO; JPO; DERWENT;	2003/07/04 12:41			0
14	BRS	L92	7	"4236948"	USPAT; US-PGPUB; EPO; JPO; DERWENT;	2003/07/04 12:41			0
15	BRS	L99	7	"4206026"	USPAT; US-PGPUB; EPO; JPO; DERWENT;	2003/07/04 12:41			0
16	BRS	L106	112	29 or 36 or 43 or 50 or 57 or 64 or 71	USPAT; US-PGPUB; EPO; JPO; DERWENT;	2003/07/04 12:41			0
17	BRS	L113	134	29 or 36 or 43 or 50 or 57 or 64 or 71 or 78 or 85 or 92 or 99 or 106	USPAT; US-PGPUB; EPO; JPO; DERWENT;	2003/07/04 12:42			0
18	BRS	L120	5	1 and (impurity or atom or substrate or semiconductor or fluorine or fluoride)	USPAT; US-PGPUB; EPO; JPO; DERWENT;	2003/07/04 12:46			0
19	BRS	L127	19	113 and (fluorine or fluoride)	USPAT; US-PGPUB; EPO; JPO; DERWENT;	2003/07/04 12:47			0
20	BRS	L134	19	113 and (fluorine or fluoride or ("Fl.sub.2"))	USPAT; US-PGPUB; EPO; JPO; DERWENT;	2003/07/04 13:33			0

	Type	L #	Hits	Search Text	DBs	Time Stamp	Comments	Error Definition	Error
21	BRS	L141	19	134 and (temperature or heat or annealing or annealed or anneal or thermal or "1000" or degrees or silicon or atoms or crystal or semiconductor or substrate or interstitial)	USPAT; US-PGPUB; EPO; JPO; DERWENT;	2003/07/04 13:05			0
22	BRS	L148	18	141 and (solid or phase or coating or coat or coated or capping or silicate or BPSG or BSG or TEOG)	USPAT; US-PGPUB; EPO; JPO; DERWENT;	2003/07/04 13:08			0
23	BRS	L155	15	148 and (glass or glassy)	USPAT; US-PGPUB; EPO; JPO; DERWENT;	2003/07/04 13:32			0
24	BRS	L169	15	155 and (interstice or tissue or organ or part or relate or gap or sapce or intervenes or holes or occupy or subject)	USPAT; US-PGPUB; EPO; JPO; DERWENT;	2003/07/04 13:33			0
25	BRS	L176	14	"5173440"	USPAT; US-PGPUB; EPO; JPO; DERWENT;	2003/07/04 13:32			0
26	BRS	L183	8	176 and (glass or glassy)	USPAT; US-PGPUB; EPO; JPO; DERWENT;	2003/07/04 13:32			0
27	BRS	L190	2	183 and (fluorine or fluoride or ("Fl.sub.2"))	USPAT; US-PGPUB; EPO; JPO; DERWENT;	2003/07/04 13:33			0
28	BRS	L197	2	190 and (interstice or tissue or organ or part or relate or gap or sapce or intervenes or holes or occupy or subject)	USPAT; US-PGPUB; EPO; JPO; DERWENT;	2003/07/04 13:33			0

	Type	Hits	Search Text	DBs	Time Stamp	Comments	Error Defin	Errors
1	BRS	590	(("438/563") or ("438/557")).ccls.	USPAT; US-PGPUB; EPO; JPO; DERWENT;	2003/07/03 17:40			0
2	BRS	144	((("438/563") or ("438/557")).ccls.) and (coating or coated or coat)	USPAT; US-PGPUB; EPO; JPO; DERWENT;	2003/07/03 17:43			0
3	BRS	42	((((("438/563") or ("438/557")).ccls.) and (coating or coated or coat)) and (silicate or BSG or BPSG or TEOG)	USPAT; US-PGPUB; EPO; JPO; DERWENT;	2003/07/03 17:42			0
4	BRS	108	((((("438/563") or ("438/557")).ccls.) and (silicate or BSG or BPSG or TEOG)) and (heating or annealing or anneal or heat or thermal or	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/07/03 17:43			0
5	BRS	103	(((((("438/563") or ("438/557")).ccls.) and (silicate or BSG or BPSG or TEOG)) and (heating or annealing or anneal or heat or thermal or temperature)) and (boron and diffuse	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/07/03 17:44			0
6	BRS	56	((((((("438/563") or ("438/557")).ccls.) and (silicate or BSG or BPSG or TEOG)) and (heating or annealing or anneal or heat or thermal or temperature)) and (boron and diffuse	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/07/03 17:44			0
7	BRS	25	(((((((("438/563") or ("438/557")).ccls.) and (silicate or BSG or BPSG or TEOG)) and (heating or annealing or anneal or heat or thermal or temperature)) and (boron and diffuse or diffusion or diffused)) and dopant) and (coating or coated or coat)) and (crystal or impurity or atom or ion or P or N or junction or silicon or "1000" or fluorine or "5" or angstrom or ((((((("438/563") or ("438/557")).ccls.) and (silicate or BSG or BPSG or TEOG)) and (heating or annealing or anneal or heat or thermal or	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/07/04 12:36			0